



AeroSpace FRONTIERS

VOLUME 23 • ISSUE 2 • FEBRUARY 2021

A photograph of a technician wearing a grey hoodie, a black baseball cap, and a blue surgical mask. The technician is focused on a dense array of bright orange cables connected to a piece of equipment. The setting appears to be a technical facility or laboratory.

Celebrating Successes in 2020

Pages 2–3

Plum Brook Renamed for Neil Armstrong

Page 5

Refurbishing ERB Test Cells

Pages 6–7

Love Your “Evolving” Library

Page 9



DIRECTOR'S
SAFETY CORNER

Day of Remembrance

This year marks the 80th anniversary of the Glenn Research Center. As we proudly celebrate our rich history and accomplishments, we must not forget the hard lessons learned and sacrifices made along the way. In late January, we remembered the crews of Apollo 1, Challenger, and Columbia during our annual Day of Remembrance. Their ultimate sacrifice has driven our culture of safety and excellence, and we honor them by continuing to vigorously address safety in spaceflight and in all that we do.

Thank you for your dedication to a safety culture.

AeroSpace Frontiers

is an official publication of Glenn Research Center, National Aeronautics and Space Administration. It is published the second Friday of each month by the Office of Communications & External Relations in the interest of the Glenn workforce, retirees, government officials, business leaders and the general public.

Submit short articles and calendar items to the editor at doreen.b.zudell@nasa.gov.

Editor: **Doreen B. Zudell**, ATS,
216-433-5317

Design: **Rhys Sampson**, ATS

Managing Editor: **Kelly R. DiFrancesco**

Circulation: **Angela Williams**, ATS,
216-433-8921

Center Marks Year of Challenges and Successes *Employees Rise to the Call*

Despite a year of unprecedented challenges, NASA Glenn employees maneuvered through the obstacles, enabling many science and technology advancements. During the virtual End of Year Town Hall on Dec. 14, senior leaders and employees across the center paused to celebrate those achievements and recognize our resilience.

Center Director Dr. Marla Pérez-Davis kicked off the event by thanking employees for their flexibility and commitment to adapting to a new work structure. She acknowledged senior leadership's hard work in shaping those specifics during

the pandemic and noted the various roles Associate Director Larry Sivic played in guiding this process.

"Today we celebrate all the accomplishments [as a team] of the past year," Pérez-Davis said. She then introduced a video, "2020 Year In Review: Celebrating Our Accomplishments," which supported these successes.

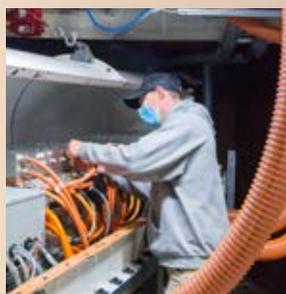
In addition to showcasing science and aeronautics achievements, the video highlighted employees' honors, innovation and partnerships, facility construction and renovation, and pandemic-related research. It concluded with sections that highlighted



GRC-2021-CN-00003

Photos by Jef Janis/Composite by Barbara Madej

Senior leaders extended well-wishes to employees during the town hall.



On the Cover:

Technician Tanner Trent checks a power connection from an inverter to a motor in Glenn's NASA Electric Aircraft Testbed (NEAT) facility. Located at NASA's Neil A. Armstrong Test Facility, NEAT is a high-power, altitude-capable testbed for hybrid-electric aircraft components and systems.

Photo by Sage Amato
GRC-2020-C-03255



GRC-2020-C-01135

Photo by Marvin Smith

The center celebrated the groundbreaking for the Aerospace Communications Facility in March 2020.

working in new ways, promoting comradery and enabling us to move forward with NASA’s mission.

Pérez-Davis shared slides outlining a number of significant activities and events scheduled for the fiscal year’s first and second quarters. Glenn’s 2021 top priorities are as follows:

Space

- Artemis I/Orion.
- Power and Propulsion Element and Advanced Electric Propulsion System.
- International Space Station Flow Boiling and Condensation Experiment.
- Nuclear Fission and Radioisotope Power Systems.

Aeronautics

- Hybrid Thermally Efficient Core.
- Electrified Aircraft Power Systems and Thermal Management Technology Development.
- Low-Boom Flight Demonstration, 8- by 6-Foot Supersonic Wind Tunnel Testing.

Institution

- Enable Future of Work Possibilities and Digital Transformation.

- Invest in Institutional Infrastructure to maintain operational readiness for Glenn’s world-class facilities and capabilities.
- Adapt center organizational structure to support the agency Mission Support operating model and Mission Directorate program/project assignments.

External Partnerships

- Develop partnership opportunities that promote innovation, NASA technology commercialization, and small business growth within Ohio and surrounding states.
- Enhance communication and collaboration with industry, academia, government, and other federal research laboratories throughout the Midwest region.

This slide presentation was followed by a video of senior leaders extending end-of-year well-wishes to employees.

Pérez-Davis closed the event by noting the kind words and support she has received for her virtual town hall meetings, which helped keep employees informed and connected.

“Despite trying times ... facing uncertainty ... we have accomplished so much,” she affirmed. “Together we are stronger.”

By Doreen B. Zudell



GRC-2020-CN-00040

Photo by Juan Agui

Glenn researchers worked with University Hospitals doctors in the spring and summer on an ozone sterilization system for COVID-19. Pictured, left to right: Sharon Miller, Bruce Banks, and Frank Lam.



GRC-2019-C-11993

Photo by Jef Janis

NASA’s Super Guppy aircraft arrived at Mansfield Lahm Regional Airport in November 2019 with the Orion spacecraft for Artemis I aboard. Glenn conducted a 4-month environmental test campaign at Plum Brook Station (now NASA’s Neil A. Armstrong Test Facility).

Innovating With University Hospitals

NASA and University Hospitals (UH) staff explored the parallels between space exploration and the next era of health care during a virtual conference last November. Center Director Dr. Marla Pérez-Davis provided opening remarks for the event, “New Frontiers: Innovating for Systemness and Well-being,” part of UH’s Health Ventures’ Health Voyagers Series. Glenn’s Deputy Director Susan Motil, along with engineer Betsy Turnbull and astronaut Doug Wheelock, provided keynote addresses. Engineers Kelly Gilkey and Sharon Miller served on panels. Topics included Next Generation Mission Control, Remote Monitoring, Astronautics and Athletics, and many more.



GRC-2021-CN-00001

Illustrated by Craighton Berman

An illustrator captures a panel discussion on “Social Isolation and Self Care: Managing Well-being in Space and at Home.” Gilkey participated in this panel.

NEWS AND EVENTS

Technology Aids People With Disabilities



GRC-2021-CN-00007

Section 508 of the Rehabilitation Act requires that federal agencies’ electronic and information technology is accessible to people with disabilities, including employees and members of the public. On Nov. 17, Glenn’s 2020 National Disability Employment Awareness Month event featured Jill Noble, Glenn’s 508 coordinator. Noble demonstrated various assistive technology and devices to help individuals with disabilities perform on the job and live independent lives. Glenn’s Disability Awareness Advisory Group and the Office of Diversity and Equal Opportunity partnered for the event.

Noble demonstrates a refreshable Braille display device, which plugs into a computer to enable a person who is blind to read 40 characters at a time on their computer screen.

Plum Brook Station Renamed Neil A. Armstrong Test Facility

Ohio's members of Congress have paid tribute to Neil Armstrong by renaming Plum Brook Station in his honor. Armstrong began his career at NASA Glenn and went on to inspire generations of scientists, engineers, and explorers.

"I'm excited to share the news that NASA's Plum Brook Station has been renamed NASA John H. Glenn Research Center at the Neil A. Armstrong Test Facility," said Center Director Dr. Marla Pérez-Davis. "As the center where he began his NASA career, NASA Glenn is proud to share the name of the first person to walk on the Moon."

The center will be working with members of Congress on plans to officially unveil the test facility in the near future.



Neil A. Armstrong, the first man to walk on the Moon, was born in Wapakoneta, Ohio, on Aug. 5, 1930. He began his NASA career at Glenn.



Dykeman

Center Welcomes New Human Resources Director

Steven Dykeman has been selected Director of Glenn's Human Resources Office, effective Dec. 7, 2020. He succeeds Susan Whitfield, who served as director since 2019.

Dykeman previously served as chief of the Human Resources Operations Center for the U.S. Citizenship and Immigration Services. Dykeman is retired from the U.S. Army and holds a bachelor's degree in psychology from Lyndon State College. He has a Master of Arts in diplomacy and international conflict management from Norwich University, and a Master of Business Administration with a human resources concentration from Southern New Hampshire University. He is currently pursuing a Ph.D. in organizational leadership at Indiana Wesleyan University.

Repurposed Test Cells Advance Aeronautics Research



GRC-2021-C-00113

Photo by Donald Hammett

The High-Performance Electromagnetic Rig (HiPER) facility is a new capability for hardware-in-the-loop testing of EAP concepts in test cell SE-17. The HiPER lab is envisioned as being a rapid test capability for EAP concepts that span all of the major Aeronautics Research Mission Directorate programs, with planned testing that supports the Hybrid Thermally Efficient Core, X-57, and Transformational Tools and Technologies projects.

Built in 1942, the Engine Research Building (ERB) is the largest and most adaptable test facility complex at Lewis Field, with 152,235 square feet of floor space housing more than 60 test rigs. Work is underway to continue ERB's legacy of enabling research by repurposing test cells for work in the area of Electrified Aircraft Propulsion (EAP).

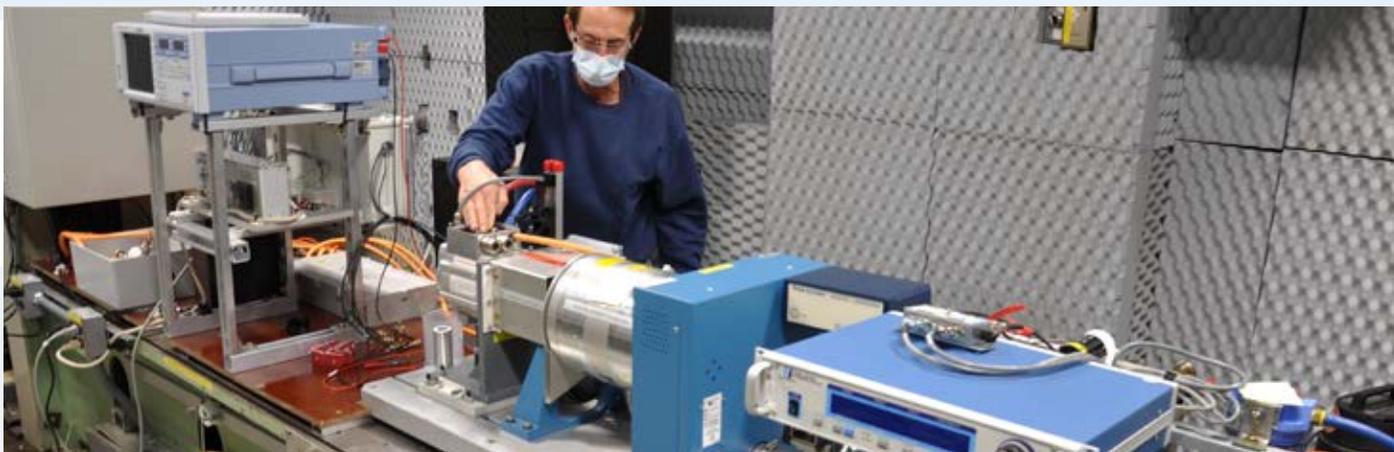
Several ERB labs have been converted recently to explore machines and drives and representative powertrain systems with a hardware-in-the-loop focus. This includes installing fiber optic networks in the cells, then linking them together to create a virtual complex. Each cell would be equipped to perform a different aspect of research.

For example, one of the ERB test cells, SE-2, had been used for research on oil-free foil bearings. The research helped foil-bearing technologies to achieve high technology readiness levels for aeronautics applications.

"The cell was dormant and had hardware suited for evaluations of high-speed rotating components," explained Susan Johnson, Aeronautics Mission Office. "The Revolutionary Vertical Lift Technology (RVLT) researchers were able to refocus the resources and make modifications needed to enable experimental capability for electric motors and magnetic gearing."

In ERB test cells SW-13 and C-5, the EAP team is investigating the RVLT and vertical takeoff and landing class of vehicles from the electric propulsion perspective. Technologies of interest include high-voltage (270 to 1,000 Vdc) distribution, high-voltage protection, and advanced motors and drives. A direct current power grid and motor emulators will be utilized to provide the ability to reconfigure for different vehicle architectures, evaluate system performance, and allow the investigation of faulted conditions. In addition, software tools are being developed that provide detailed sizing and performance analysis of integrated vehicle electrical, mechanical, and thermal systems over a defined mission profile. The test cells will also enable testing of novel thermal management concepts developed by RVLT.

"NASA is examining the possibility of electrifying air vehicle propulsion systems for vertical lift and fixed-wing vehicles in order to help save energy and fuel, provide cost savings, and increase mobility," said Amy Jankovsky, Aeronautics Mission Office.



GRC-2021-C-00111

Photo by Donald Hammett

Technician John Veneziano checks the equipment installation in the ERB SW-13 test cell. It was recently refurbished to conduct propulsion power quality experiments for the NASA RVLT program.

Jankovsky said there are weight and safety challenges that must be addressed for aeronautics applications. Glenn researchers are working on technologies to enable flight-weight electric machines that can be used as a motor/generator, geared to a turbine's shaft to produce electricity in flight and allow electric assist to the engines, and also as a motor to drive a fan or propulsor. To drive those machines and protect the power system, Glenn is also developing advanced power electronics, fault protection, and controls techniques.

“For very large, long-range aircraft, it is likely that superconducting technologies will be needed in the machines and power distribution,” said Jerry Brown, Rotating and Drive Systems Branch.

To explore fundamental physics related to how superconductors actually exhibit losses under alternating current conditions inherent to electrical machines, SW-18 has been built up to house a superconducting core test rig. The temperature capability of that rig extends down to 20 K, the boiling point of liquid hydrogen. This covers the range needed for research on the superconducting materials expected to be needed for the large aircraft. The core test

rig produces the same conditions of temperature and magnetic field that the materials would experience in those aircraft.

“The ERB has gone through many adaptations over the years,” said Facility Manager Gwynn Severt. “While largely an engine-components building, it now houses facilities that support space research as well. The transition of some of the facilities to space-related activities comes from the need to be flexible in our pursuits as a center. ERB is a testament to that need. It is the most adaptable facility on the lab and has been used throughout the years to support the ever-changing goals of the research community at Glenn.”

Severt said that due to the age of the facility, transitions can be challenging. Refurbishments can take time but are an asset to the building. They transition unutilized test cells to updated facilities and make the building more attractive to other potential users. The current transition into the area of EAP is allowing Glenn to again adapt dormant ERB facilities to meet planned and projected work that contributes to mission programs and projects in the Aeronautics Research Mission Directorate.

By Doreen B. Zudell



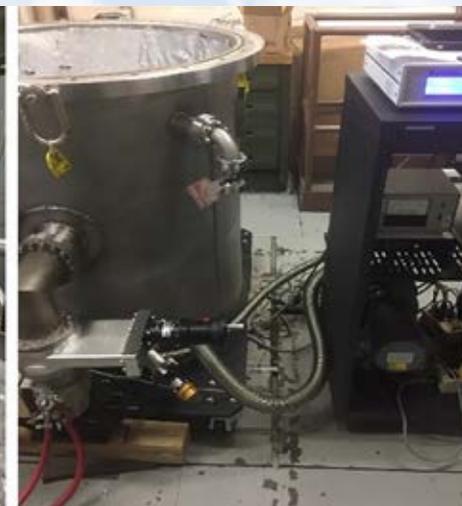
GRC-2021-C-00110

This new test rig, which stands over 8 feet tall, measures alternating and rotating current losses in superconducting coils.



GRC-2021-C-00112

Apparatus for conducting testing of superconducting samples and systems.



Technology Transfer License Highlight: Commercial License

Glenn's Technology Transfer Office (TTO) offers a variety of ways to license a NASA technology. TTO identifies the ideal license and technology that fit a company based on criteria under four different licenses: commercial, research, government use, and the Startup NASA license.

A commercial license secures rights to make and sell products based on NASA technologies. Each license is negotiated on a case-by-case basis, providing the most flexible and business-friendly approach to the broad range of companies and industries that license NASA technologies.

During fiscal year 2020, Aerogel Technologies expanded the exclusivity of their commercial license to increase their growing list of applications of Glenn's suite of polyamide and polyimide aerogel technologies. Their aerogel applications range from aviation interiors and rocket fairings to electric vehicle batteries and consumer electronics. Aerogel Technologies is even working on applying the suite of technologies to a line of insulated winter apparel and footwear. The applications seem endless with this Glenn technology, making an impact on future space missions and everyday products.

TTO strives to leverage Glenn's technologies and make them commercially available to the private sector through licensing. NASA technologies moving from mission to business stimulates the economy, makes U.S. companies more competitive, and creates jobs to make research and development done at Glenn truly "for the benefit of all."

TTO will be sharing more information about the different types of licenses in future issues of AeroSpace Frontiers. For more information on NASA Glenn's technologies available for licensing, visit <https://technology.grc.nasa.gov>.

By Lauren Simmers



GRC-2021-CN-00002

Photo courtesy of Aerogel Technologies

New Airloy polyimide aerogels from Aerogel Technologies. Left top: Airloy X116 flexible film; left bottom: high-temperature Airloy HR116 tape; top right: transparent Airloy X116 thin film; bottom right: superinsulating Airloy HR116 insole.

On-site Work Underway With ACME

Although most Glenn employees have been teleworking since March 2020, critical tasks such as experiment operations on the International Space Station (ISS) continue on-site. An example is the Advanced Combustion via Microgravity Experiments (ACME) project, which includes six independent investigations of laminar, non-premixed flames of gaseous fuels. While astronauts set up the hardware within the Combustion Integrated Rack (CIR), the tests are remotely commanded by ACME's operations team. This includes Project Scientist Dennis Stocker, pictured in January 2020, from the Glenn ISS Payload Operations Center (GIPOC).

Recent testing was performed as part of a joint study with the University of Maryland and Russia's Peter the Great St. Petersburg Polytechnic University. It has focused on spacecraft fire safety through an innovative investigation of material flammability in atmospheres being considered for future spacecraft. On-orbit ACME operations have been underway since September 2017 and are expected to conclude this year.



GRC-2020-C-00116

Photo by Marvin Smith

“Love Your Library” Month

The Glenn Science and Engineering Library Evolves Throughout 78 Years



GRC-2021-CN-00004 Photo by Robin Pertz
The library seating area in the RAC today.

Robin Pertz, Glenn’s Library, History, and Records supervisor, takes a look back on some of the library’s physical and technological advancements.

In January 1943, just 2 years after shovels broke ground for the National Advisory Committee for Aeronautics (NACA) Aircraft Engine Research Laboratory (AERL), the center’s library first opened its doors in the Administration Building. A 35- by 60-foot room with large windows and black walnut woodwork housed about 900 books and 37 journals. Head librarian Phyllis Snyder and engineer Levi Smith, reference technician for Air Force Technical Orders, served the center’s unique research demands. Over the past 78 years, the Glenn library has evolved to continue meeting the center’s research needs.

The library remained in the Administration Building until construction of the Business Service Center in Building 60 was completed in February 1966. The new space, designed by then-director Abe Silverstein, was twice the size of the former library. The larger quarters offered additional stack

space for some 27,000 books and 150,000 reports and materials. Computing and tabulating machines were installed in the basement area of the new space.

In 1985, the library took its first steps in electronic card cataloging, although the materials themselves were not electronic. Everything was barcoded and checked out electronically.

In May of 1989, a steam pipe burst, ruining the entire microfiche collection and fusing posters to the walls. While the library closed for repairs, Chief George Mandel tasked the staff with conducting a full inventory of all checked-out materials.

By 1990, the library was the first NASA center library to use OCLC (Online Computer Library Center). This began the shift from cataloging based on the Dewey Decimal System to the Library of Congress cataloging standards currently followed by all NASA libraries.

In 2007, the center converted the Research Analysis Center (RAC) Mainframe Computer Equipment Room on the first floor to usable office space. Following this conversion, the library, learning center, and History Office consolidated and moved in. By 2009, the Knowledge Resources and Information Services Center was opened in what is now the library’s current location.

As needs of the science community across the world and the agency have changed, the Glenn library has evolved to meet the needs of its users. During the COVID-19 pandemic, library staff at Glenn and across the agency have continued to provide remote research support and professional development from their home offices.

As the Glenn Science and Engineering Library celebrates 78 years of serving its customers, there is more reason than ever before to Love Your Library.

Check Out These Services!

Virtual reference	
Research	
Citation verification	
Business Intelligence/data visualization	
Professional development recommendations	
Interlibrary loan (currently electronic materials only)	
Copyright guidance	



GRC-1943-C-01844
The library at the NACA’s AERL in Cleveland was initially located in the Administration Building. It housed a wide variety of aeronautics-related publications for its research staff to consult.

RETIREMENTS

Irene Cierchacki, Technology Transfer Office, Office of Technology Incubation and Innovation, retired Jan. 1, 2021, with 37 ½ years of NASA service.

Susan M. Johnson, Aeronautics Mission Office, Aeronautics Directorate, retired Jan. 2, 2021, with 46 ½ years of NASA service.

Robert (Bob) Piccus, Office of Cybersecurity Services, Office of Chief Information Officer, retired Jan. 2, 2021, with 10 years of NASA service.

Thomas M. Tomsik, Fluid and Cryogenics Systems Branch, Propulsion Division, retired Dec. 31, 2020, with 31 years of NASA service.

Dr. Kim Allen Veris, Legislative Affairs Officer, Office of the Director, retired Jan. 1, 2021, with 42 years of federal service, including 36 with NASA.

Mark R. Woike, Optics and Photonics Branch, Communications and Intelligent Systems Division, retired Dec. 31, 2020, with 33 ½ years of NASA service.



Cierchacki



Johnson



Piccus



Dr. Veris

MORE THAN A MEMORY

Werner R. Britsch, 98, a 1988 retiree with 30 years of NASA service, died Dec. 24, 2020. A World War II U.S. Army veteran, Britsch worked as an engineer in the Compressor and Turbine Division, the Chemical Rocket Division, and the Fluids Systems and Components Division. He participated in the Engine Component Improvement Project and received a Group Achievement Award in 1983 with the Energy Efficient Engine Project team. He retired from the High Speed Propulsion Technology Branch of the Propulsion Systems Division.



Britsch

Lucille "Lucy" C. Geysler, 85, a 1990 retiree with 30 years of NASA service, died Oct. 16, 2020. Geysler joined NACA/NASA in 1954 as a computer. She served primarily in the Computer Services Division and earned acclaim as a member of the Mainframe Systems Branch. She co-authored three award-winning NASA Tech Briefs and earned NASA Group Awards on system migration and integration teams. She was one of the founders of Glenn's Business and Professional Women's Club and held offices in the IFPTE union. Her brother, Ronald Everett, retired in 2004.



Geysler

Joan V. Haug, 77, a 2016 retiree with 29 years of NASA service, died Dec. 4, 2020. Haug was the lead purchasing agent in Glenn's Procurement Division. She earned several significant awards during her tenure. Haug was named Glenn's Small Business Procurement Person of the Year (2013) and was awarded the NASA Exceptional Service Medal (2017). She received honorable mention for the Associate Administrator Technology Innovation Awards as a member of the Commercial Supersonics Technology Low Noise Propulsion Technical Challenge Team (2016).



Haug

Edward J. Paulin, 94, a 1983 retiree with 34 years of NASA service, died Dec. 19, 2020. He was a veteran of World War II, serving in the U.S. Navy. After his wartime service he worked for NACA/NASA as an electrician and then as a supervisor from 1949 to 1983. His duties spanned from the pre-space era through the beginning of the space shuttle era. His legacy at NASA continued with two sons working at the center, Jeffrey (retired) and Robert, Testing Division.



Paulin

Perseverance Rover To Land on Mars!

- Completes its 293-million-mile (471-million-kilometer) journey on Feb. 18.
- Blazes through Mars' atmosphere at about 12,100 mph (19,500 kph).
- Touches down gently on the surface at approximately 12:30 p.m. PST (3:30 p.m. EST).

NASA TV will have full coverage.

The Great Lakes Science Center will host a virtual event.



Check Today@Glenn for more information.

Check Out the Latest Spinoff Publication

The latest edition of NASA's Spinoff publication highlights dozens of companies that have benefited from cooperation with NASA.

- Invests in existing companies large and small.
- Paves paths for entrepreneurs to start new businesses.
- Creates new jobs.
- Enables cutting-edge products that improve daily life.

Visit <https://go.nasa.gov/2KVqaFB>



INFORMATION CAFE

On Wed., Feb. 17, from 11 to 11:45 a.m., the library will host its monthly Information Cafe, a mini lesson about Glenn library-related topics. February's Information Cafe features a virtual tour of the library website, resources, and all the services they provide to the Glenn community! Check Today@Glenn for the link.

POC: Robin Pertz, 3-5776

OUTDOOR SIREN TESTING

The Emergency Management Office staff will conduct a mass notification voice test at Building 15 on Wed., March 3, at Lewis Field. An audible siren test will be conducted on the "all clear" tone on Sat., March 6.

POC: Allen Turner, 3-6826

FITNESS CENTER CLASSES

Glenn's Fitness Center has added virtual classes and programs this year. Check out the new stretching class, weekend workouts, and wellness programs. Live and recorded classes available. For more information, visit <https://www.grc.nasa.gov/smadv/fitness/>.

POC: Bob Laws, 3-6313

LOOKING UP IN 2021

Why not start your new year with a new perspective? Look up! NASA Glenn has several prayer groups and Bible studies, and they are always open to new members. Visit the website at <https://www.grc.nasa.gov/prayergroup/> to review the list of ongoing Christian activities. All are welcome! Most groups will continue meeting virtually for as long as necessary.

POC: David DeFelice, 3-6186

Deadline for next calendar section is **Feb. 17, noon**. News and feature stories require additional time.



National Aeronautics and
Space Administration

John H. Glenn Research Center

Lewis Field

21000 Brookpark Road
Cleveland, Ohio 44135

Neil A. Armstrong Test Facility

3597 E. Scheid Road
Sandusky, Ohio 44870

www.nasa.gov

Read AeroSpace Frontiers online at <http://www.nasa.gov/centers/glenn/news/AF/index.html>.



NASA Celebrates Establishment of Center in Cleveland 80 Years Ago

On Jan. 23, 1941, local authorities, military representatives, and agency officials assembled in Cleveland to initiate construction for a new research center for the National Advisory Committee for Aeronautics (NACA). NACA Director of Research George Lewis stated, "I feel confident today in saying that this new aircraft engine research laboratory will be the mecca for all the world's aircraft engine engineers and research workers."

Eighty years later, the laboratory, now known as NASA's John H. Glenn Research Center, is one of 10 centers and a leading economic contributor to the Cleveland area.

Exactly 1 year before the groundbreaking, the NACA formally proposed the creation of a new research laboratory

dedicated to aeropropulsion. During the interim, the committee evaluated locations for the facility across the Midwest before selecting Cleveland, Ohio, in November 1940.

The Cleveland Chamber of Commerce scheduled a full day of activities for that cold January Thursday in 1941. In the morning, the cadre of officials toured the Alcoa and the Cleveland Pneumatic Tool Company plants. The former was a key supplier of aluminum aircraft parts and the latter produced landing gears for the Douglas XB-19—then, the nation's largest bomber.

Read more about NASA Glenn's beginning in an online article by Archivist Robert Arrighi at <https://go.nasa.gov/2LIEbXP>.



NACA leaders view a model of the new Aircraft Engine Research Laboratory (AERL) in 1942. From left to right: Ernest Whitney (Construction Engineer), John Victory (NACA Executive Secretary), Carlton Kemper (AERL Executive Engineer), George Lewis (Director of NACA research), Edward Chamberlain (NACA Executive Officer), Raymond Sharp (AERL manager), and Henry Reid (Langley Engineer-In-Charge).

Emergency and Inclement Weather Lines

Lewis Field: 216-433-9328 (WEAT)

Neil A. Armstrong Test Facility: 419-621-3333

Connect With Glenn

